

WQB "Wide Aperture Quad" for Main Injector

31 March 2005, 9:00 AM

IB2 conference room

Attendees: Linda Alsip, Bruce Brown, John Carson, Weiren Chou, Camille Ginsburg, Hank Glass, Dave Harding, Dave Johnson, Linda Valerio, John Zweibohmer

Fabrication

The main coils for the first magnet have been wound and wrapped with glass tape. The tooling is being modified for easier use. Trim coil winding has started, and a number of bugs have been worked out. Vladimir specified the length of the base core, and the parts and tooling have been modified. One quarter core was stacked, but the controller on the stacking fixture broke, preventing compressive force from being applied reliably. New parts are being procured and it is expected that operation will resume shortly. The vacuum impregnation mold is being prepared for use, sealing seams with RTV and other such activities. Some standard fittings are being modified to make the connection between the conductor and the water manifold. If that works as expected, the manifold drawings will be completed and released soon.

There has been some slippage in the schedule. Currently we see
First article to MTF the first week of May 24
First magnet available for installation 15 June
Fourth magnet available for installation 10 August
Seventh magnet ready for installation 13 October

Beam tubes

Gregg Kobliska visited the beam tube vendor two weeks ago and was encouraged. They have reported this week that the round tubes have returned from the annealer, after having the welds burnished. They are now expecting the tooling to be delivered next week, and will start work on the tubes immediately. In the drawing process there will be some elongation of the material from its initial 120" length. They have the inspection gauge that we sent them. The first formed tube will be sent to us by air freight. Sketches are ready of the tooling for trying to swage the ends of a 4Q120 beam tube to make a smooth transition from the star shape to round.

Installation

Linda Valerio has temporarily taken over responsibility for installation from Lucy Nobrega and is still learning the status of preparations. John Carson will send her an assembly drawing. It was reiterated that the beam tube will end with a 6" flange. If a taper from the star shape to round is possible, that will be done. Otherwise, there will be a square transition. We need fiducial requirements. Dave Johnson will initiate the contact with Alignment, but John Carson will talk directly with them and agree on fiducial locations. Unless told otherwise, TD will supply the magnets with 2 3/4" female pipe threads for water. What kind of flags are requested? For support, the magnet will be equipped with three threaded holes on the bottom in the same locations as the holes on an IQB. AD can screw in balls or cups or anything else convenient. The magnet will be larger, so new stands are required. The BPM design is thought to be nearing completion.

Specification

Weiren showed cross-sections and demonstrated that the geometrical admittance of the quadrupole-Lambertson system should double. The region of interest extends out to ± 51 mm.

A 1% integrated gradient change leads to a tune change of 0.0045, so seven magnets would give an unacceptable horizontal tune change of 0.0315. A factor of ten better, 0.1% or ten units, would give an acceptable 0.003 change in tune. (The vertical tune change is less.) This should be the target, both absolutely and as a function of position.

Dave Harding showed a summary of the measurements on IQB quadrupoles. The standard deviation of the distribution of strengths is just under 0.1% over most of the excitation range.

Measurement and refinement plan

Dave outlined his broad expectations: The first effort will be to determine the shape of the pole end insert to achieve an acceptable field uniformity. Once that is done, the overall length can be determined. A typical cycle for the shape work would include measurement time, analysis time, thinking time, proposal time, decision time, fabrication time, and reinstallation time. One week per cycle is aggressive. We can easily imagine three iterations. The length determination will then be relatively quick. It was agreed to match the mean IQB strengths at 120 GeV (about 2800 A).

A field measurement out to and beyond 51 mm is needed. With the 55 mm pole radius, it will be easy to reach that far with a standard Morgan coil. Measurements off-center vertically are not essential, but could be interesting on one magnet to characterize assembly errors. An end body separation is needed initially. After that, it should be sufficient to measure the integrated strength. Only one end of the magnet needs to be changed, or both ends can be changed to double the effect. There is no advantage to changing the two ends differently and doing a body end-separation on each. After final assembly with beam tube the first two magnets, at least, should have the magnetic center determined with a single wire stretched wire measurement. Dave Harding, Hank, and Camille will draft a more detailed measurement proposal for further discussion.

Next meeting in two weeks: Thursday, 14 April 2005. Same time, same place.